REMARKS/ARGUMENTS

I. Status of Claims

Prior to this Amendment, claims 1-28 were pending of which claims 1, 10, 15 and 20 are independent. By this Amendment, claims 1, 10, 12, 15, 18, 20, and 22-28 have been amended.

II. Abstract

The Abstract of the Disclosure has been amended in accordance with the Examiner's reminder. The Abstract of the Disclosure is now believed to conform to the language and format requirement stipulated in the MPEP.

III. Rejection under 35 U.S.C § 112

Claims 15-19 are rejected under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the term "the pause time" is rejected as lacking antecedent basis. Further, claims 16-19 are rejected as being dependent of the rejected claim 15.

Claim 15 has been amended to provide the antecedent basis for the term "the pause time". Specifically, the preamble of claim 15 now recites "a pause time", which provides the necessary antecedent basis for the term "the pause time". Accordingly, the Examiner is kindly requested to withdraw the rejection.

IV. Rejections under 35 U.S.C. §103 (a)

A. Claims 1, 2, 6, 7, 8, 20, 21 and 22

Claims 1, 2, 6, 7, 8, 20, 21 and 22 are rejected under 35 U.S.C. §103(a) as being unpatentable over the background of U.S. Publication No. 20030185249 to Davies, et al. (hereinafter Davies) in view of the invention of Davies. Applicants respectfully traverse the rejection.

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It appears that the rejection may be made under 35 U.S.C. § 102, since both the background of Davies and the invention of Davies are contained in a single reference. Nonetheless, Applicants respectfully traverse the rejection under 35 U.S.C. § 103 in accordance with the Examiner's differentiation between the background of Davies and the invention of Davies.

Before discussing the differences between the cited references and the present application, it is believed to be beneficial to first give a brief overview of Applicants' disclosure. Typically, a switching system on a communication network includes a network switch for transmitting data received from a plurality of source nodes to at least one desired node of a plurality of destination nodes. A typical example of the switching system is one based on the Ethernet described in IEEE standard 802.3. Specifically, IEEE standard 802.3 defines a "PAUSE" frame, which is designed to let a source node to stop further transmitting Ethernet frames if a switching system connected to the source node detects that a congestion traffic state has occurred. However, under the conventional technology, the source node stops all traffic transmissions directed to a corresponding input port irrespective of the type of the traffic when the source node receives a PAUSE frame. This results in, for example, voice traffic, which is a desired to have a higher priority over data traffic, being blocked along with data traffic when a congestion traffic state has occurred.

Before turning to the details of the solution to the above-mentioned problem provided by the method and apparatus disclosed in the present application, a quick comparison between a "class of service" and a "priority class" is believed to be helpful. It is known that IEEE 802.1Q defines a 3-bit field for a maximum of eight possible priority classes for traffic purposes. The 3-bit field is contained in a Layer-2 media access control (MAC) header. On the other hand, it is also known that there are predefined classes of service (CoS) or the so-called DSCP (differentiated service code point). Although the priority class of an Ethernet frame may be set based on the CoS, a CoS is quite different from a priority class defined in IEEE 802.1Q. Specifically, a CoS is a field that differentiates an Ethernet frame by the type of service that the

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Ethernet frame provides, whereas a priority class merely denotes one of the eight priority levels of an Ethernet frame, as defined in IEEE 802.1Q. To be more specific, a priority class does not concern the type of **service** that an Ethernet frame provides, whereas a CoS does. For better illustration, examples of a CoS include "voice service" or "data service", which are predefined independent of the eight priority classes defined in IEEE 802.1Q, whereas examples of a priority class are merely numerical values ranging from zero through seven.

The switching method and switching apparatus disclosed in the present application is designed to solve the aforementioned problem associated with a source node stopping all traffic irrespective of whether the traffic is for voice service or for data service when receiving a PAUSE frame. In particular, the shared memory of the switching apparatus is divided into a plurality of data buffers for every input port on the basis of the CoS of the received Ethernet frame. Further, PAUSE frame is modified to have a new data format necessary for differentially applying a PAUSE process based on a CoS. By incorporating these two mechanisms, the method and apparatus is able to differentiate each received Ethernet frame by its CoS and effectively prioritize the transmission of each Ethernet frame based on the priority information associated with its CoS.

i.   Claim 1

Claim 1 recites a switching control method for controlling traffic flow of an Ethernet frame. The method comprises the steps of:

> receiving an Ethernet frame containing predetermined priority information based on a type of traffic as a class of service (CoS) from a source node.

> buffering the received Ethernet frame in a data buffer classified by the CoS;

> comparing a size of data currently buffered in the data buffer with a predetermined threshold value;

when the size of data currently buffered in the data buffer is equal to or larger than the threshold value, <u>generating a PAUSE frame containing a value of the CoS</u>; and

transmitting the PAUSE frame to the source node.
(emphasis added).

The cited references, namely, the background of Davies and the invention of Davies, do not disclose, teach, or suggest the subject matter recited in claim 1. In particular, neither the background of Davies nor the invention of Davies discloses, teaches or suggest <u>buffering the received Ethernet frame in a data buffer classified by the CoS</u> and <u>generating a PAUSE frame containing a value of the CoS</u>.

First, neither the background of Davies nor the invention of Davies discloses, teaches or suggests <u>buffering the received Ethernet frame in a data buffer classified by the CoS</u>. Davies, taken as a whole, <u>at best</u>, discloses buffering the received Ethernet frame in a data buffer **classified by a priority class** (See abstract, paragraph [0003], Figs. 1 and 2 of Davies), as opposed to buffering the received Ethernet frame in a data buffer **classified by the class of service.** In fact, nowhere does Davies disclose, teach, or suggest a **class of service**, or a CoS, much less <u>buffering the received Ethernet frame in a data buffer classified by the CoS</u>, as claimed.

Specifically, paragraph [0003] of Davies states "[F]rames are queued for transmission in up to **either queues corresponding to ranges of priorities...**"(emphasis added). In addition, both embodiments of Davies' invention, as demonstrated in Figs. 1-2 respectively, clearly show eight queues in Ethernet Switch/Hub 300, each representing one priority class. To further confirm this buffer arrangement based on <u>priority classes</u>, paragraph [0055] of Davies summarizes that "[I]n this way the end points 100, 301 of the link are connected by a single physical link which is subdivided into **eight** logical links, each used for **one class of 802.1Q traffic**" (emphasis added). As discussed above, IEEE 802.1Q merely defines the 3-bit priority classes. IEEE 802.1Q, however, does not define a **class of service.** Therefore, "one class of 802.1Q traffic", as discloses by Davies, merely denotes one of the eight

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possible priority classes defined in IEEE 802.1Q, which, as discussed above, is not the same as a **class of service**, as recited in claim 1.

Accordingly, contrary to the Examiner's understanding of Davies, Davies, at best, teaches buffering the received Ethernet frame in a data buffer classified by a priority class, rather than buffering the received Ethernet frame in a data buffer classified by the CoS, as claimed.

Further, neither the background of Davies nor the invention of Davies discloses, teaches or suggests generating a PAUSE frame containing a value of the CoS. With respect to this finding, the Examiner is kindly directed to the relevant section of Davies teaching of PAUSE FRAME in paragraph [0052], which states the following:

> "If a situation occurs in which one of the low priority queues is blocked by receiver overload as envisaged above, then the PAUSE frame mechanism is preferably used to suppress transmission of traffic from that specific queue whilst leaving the higher priority (and lower priority) frames free to transmit on the other links."

Evident from the text quoted above, Davies does not disclose, teach, or suggest generating a PAUSE frame **containing a value of the CoS**.

This finding is hardly surprising. As discussed above, nowhere does Davies disclose, teach, or suggest a **class of service**. In addition, the mechanism of sending a PAUSE frame to stop transmission, as disclosed in Davies, does not involve any class of service. Further, according to the scheme disclosed in Davies, each of the eight queues in the Ethernet Switch/Hub 300 has a one-to-one correspondence to one of the corresponding eight queues in the Ethernet Tx 100 or Ethernet NIC 100, with respect to transmitting and receiving Ethernet frames, regardless of whether multiplexing and de-multiplexing techniques are employed in the process of placing the Ethernet frames from one of the eight transmitting queues to the corresponding one of the eight receiving queues.

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As a result, if a PAUSE frame is transmitted from one of the eight queues in the Ethernet Switch/Hub 300 to Ethernet Tx 100 or Ethernet NIC 100 in order to suspend transmission, the PAUSE frame will always be received by the corresponding queue located in the opposite Ethernet Tx 100 or Ethernet NIC 100. See paragraph [0052] of Davies. Under this arrangement of Davies' scheme, there is no need for Davies to place a value of the CoS in the PAUSE frame so as to inform the source node to stop transmission on the Ethernet frames belonging to the particular CoS. Accordingly, contrary to the Examiner's understanding of Davies, Davies does not disclose, teach, or suggest generating a PAUSE frame containing a value of the CoS, as claimed.

Accordingly, since the background of Davies and the invention of Davies, taken either singly or in combination, do not disclose, teach, or suggest buffering the received Ethernet frame in a data buffer classified by the CoS and generating a PAUSE frame containing a value of the CoS, the subject matter recited in claim 1 is allowable over the background of Davies and the invention of Davies. The rejection of claim 1 should therefore be withdrawn.

ii.   Claim 20

Similar to claim 1, claim 20 also relates to data buffer being classified based on a class of service (CoS) and transmitting the PAUSE frame to the source node wherein the PAUSE frame contains a value of the CoS. As discussed in connection with claim 1, neither the background of Davies nor the invention of Davies discloses, teaches, or suggests these two features. Accordingly, claim 20 is also believed to be allowable over the background of Davies and the invention of Davies. The rejection of claim 20 should therefore be withdrawn.

iii.   Claims 2, 6, 7, 8, 21 and 22

The rejection of claims 2, 6, 7, 8, 21 and 22 should also be withdrawn by virtue of their dependence from allowable claims 1 and 20.

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B. Claims 5, 9, 10-14, 23-28

i. **Claims 5, 9 and 23-28**

Claims 5, 26, 27, and 28 are rejected under 35 U.S.C. §103(a) as being unpatentable over the background of Davies, in view of the invention of Davies, and further in view of U.S. Publication No. 20030147347 to Chen et al. (hereinafter Chen). Further, claim 9 is rejected under 35 U.S.C. §103(a) as being unpatentable over the background of the Davies in view of the invention of Davies. Still further, claim 23 is rejected under 35 U.S.C. §103(a) as being unpatentable over background of Davies, in view of the invention of Davies, and further in view of U.S. Patent No. 6,754,179 to Lin (hereinafter Lin). Still further, claim 24 is rejected under 35 U.S.C. §103(a) as being unpatentable over the background of Davies in view of the invention of Davies, and further in view of Lin and U.S. Patent No. 6,724,725, to Dreyer et al. (hereinafter Dreyer). Still further, claim 25 is rejected under 35 U.S.C. §103(a) as being unpatentable over the background of Davies in view of the invention of Davies, and further in view of Dreyer. Applicants respectfully traverse these rejections.

Claims 5, 9 and 23-28 depend from independent claims 1 and 20 respectively, and thus inherit all the limitations of the independent claims. Secondary references Chen, Lin and Dreyer are merely recited for secondary features recited in claims 5, 9 and 23-28 respectively. However, none of Chen, Lin and Dreyer is found to cure the deficiencies of the background of Davies and the invention of Davies, namely, Davies' failure to disclose, teach, or suggest buffering the received Ethernet frame in a data buffer classified by the CoS and generating a PAUSE frame containing a value of the CoS.

Chen, which is the closest reference among the three, merely discloses that free space of the buffer is less than a predetermined "threshold of serious system congestion", then the system enters into the ALL XOFF state, and the system is still in the XOFF state until escaping system congestion state. However, Chen does not

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disclose any features regarding classes of service (i.e., CoS). At best, Chen just provides a general method for congestion control when using memory.

Accordingly, Applicants respectfully submit that none of Chen, Lin and Dreyer is found to cure the deficiencies of the background of Davies and the invention of Davies, namely, Davies' failure to disclose, teach, or suggest buffering the received Ethernet frame in a data buffer classified by the CoS and generating a PAUSE frame containing a value of the CoS.

Accordingly, Applicants need not further discuss Chen, Lin and Dreyer in relation to the patentability of claims 5, 9 and 23-28, and claims 5, 9 and 23-28 should be allowable over the background of Davies, the invention of Davies, and the secondary references cited against them respectively. The rejections of claims 5, 9 and 23-28 should therefore be withdrawn.

ii.   Claims 10-14

Claims 10, 11, 12, and 14 are rejected under 35 U.S.C. (a) as being unpatentable over the background of Davies in view of the invention of Davies, and further in view of Lin and GB Patent Application 2,372,679 to Pope et al. (hereinafter Pope). Claim 13 is rejected under 35 U.S.C. §103(a) as being unpatentable over the background of Davies in view of the invention of Davies, the background of Lin, and further in view of Chen and U.S. Patent No. 7,061,868 to Ahlfors et al. (hereinafter Ahlfors). Applicants respectfully traverse these rejections.

Claim 10 recites extracting a payload of the Ethernet frame to be transmitted to the destination node from a data buffer according to a type of traffic as a class of service (CoS), the data buffer buffering the payload of the Ethernet frame based on the CoS and generating an UNPAUSE frame having a value of the CoS and information indicating termination of a PAUSE state.

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As discussed above in connection with the rejection of claim 1, the background of Davies and the invention of Davies, taken either singly or in combination, do not disclose, teach, or suggest buffering the received Ethernet frame in a data buffer classified by the CoS and generating a PAUSE frame containing a value of the CoS. Specifically, nowhere does Davies disclose, teach, or suggest a **class of service**, or a CoS.

Accordingly, the background of Davies and the invention of Davies, taken either singly or in combination, do not disclose, teach, or suggest <u>extracting a payload of the Ethernet frame to be transmitted to the destination node from a data buffer</u> **<u>according to a type of traffic as a class of service, the data buffer buffering the</u>** <u>payload of the Ethernet frame **based on the CoS**</u>, as recited in claim 10, and <u>generating an UNPAUSE frame **having a value of the CoS** and information indicating termination of a PAUSE state</u>, as recited in claim 10.

Secondary references Lin and Pope are merely cited for disclosing other features of claim 10. Neither Lin nor Pope, however, is found to cure the above deficiencies of the background of Davies and the invention of Davies with respect to claim 10. Accordingly, Applicants need not further discuss Lin and Pope in relation to the patentability of claim 10, and claim 10 should be allowable over the background of Davies, the invention of Davies, and Lin and Pope. The rejections of claim 10 should therefore be withdrawn.

Claims 11-14 depends from independent claim 10, and thus inherits all the limitations of the independent claim. Secondary references Lin, Pope and Ahlfors are merely recited for secondary features recited in claims 11-14 respectively. However, none of Lin, Pope and Ahlfors is found to cure the deficiencies of the background of Davies and the invention of Davies discussed above with respect to claim 10.

Accordingly, Applicants need not further discuss Lin, Pope and Ahlfors in relation to the patentability of claims 11-14, and claims 11-14 should be allowable

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over the background of Davies, the invention of Davies, and the secondary references cited against them respectively. The rejections of claims 11-14 should therefore be withdrawn.

C. Claims 15-19

Claims 15, 16, and 17 are rejected under 35 U.S.C. §103(a) as being unpatentable over the background of Davies in view of the invention of Davies and Dreyer. Claims 18 and 19 are rejected under 35 U.S.C. §103(a) as being unpatentable over the background of Davies in view of the invention of Davies, Dreyer and further in view of the background of Lin. Applicants respectfully traverse these rejections.

Claim 15 recites a switching control method for controlling traffic flow of an Ethernet frame which is received from at least one source node and is transmitted to at least one destination node, wherein a PAUSE frame had been transmitted to the at least one source node, the PAUSE frame containing a value of a class of service (CoS), the method comprising the steps of:

> allowing a predetermined network unit controlling the traffic flow to start an internal timer and to determine whether the pause time has expired;

> if the pause time has expired, comparing a size of data currently buffered in a data buffer based on a type of traffic as the CoS with a predetermined threshold value;

> when the size of data currently buffered in the data buffer is equal to or larger than the threshold value, re-generating a PAUSE frame containing a value of the CoS and information of the pause time; and

> transmitting the regenerated PAUSE frame to the source node.
> (emphasis added).

Specifically, the preamble of claim 15 recites the structural feature relating to the PAUSE frame containing a value of a class of service (CoS). MPEP § 2101.02

requires that "any terminology in the preamble that limits the structure of the claimed invention must be treated as a claim limitation". Accordingly, the structural feature of the PAUSE frame recited in the preamble of claim 15 must be treated as a claim limitation.

As discussed in connection with the rejection of claim 1, the background of Davies and the invention of Davies, taken either singly or in combination, do not disclose, teach, or suggest generating a PAUSE frame containing a value of the CoS. Accordingly, the background of Davies and the invention of Davies fail to disclose, teach, or suggest the PAUSE frame containing a value of a class of service (CoS), as recited in the preamble of claim 15.

In addition, nowhere does Davies disclose, teach, or suggest re-generating a PAUSE frame containing a value of the CoS and information of the pause time under a specific condition when the pause time has expired. Specifically, Davies only discloses, teaches, or suggests generating a PAUSE frame. See paragraph [0052] of Davies. Davies simply does not teach re-generating a PAUSE frame under any condition when the pause time has expired. Accordingly, Davies, as a whole, does not disclose, teach, or suggest re-generating a PAUSE frame containing a value of the CoS and information of the pause time if the pause time has expired and when the size of data currently buffered in the data buffer is equal to or larger than the threshold value, in accordance with claim 10.

Accordingly, the background of Davies and the invention of Davies, taken either singly or in combination, do not disclose, teach, or suggest the subject matter recited in claim 10. Dreyer, as a secondary reference, is merely cited for disclosing features relating to starting an internal timer to determine whether a particular timer has expired. Dreyer, however, is not found to cure the above deficiencies of the background of Davies and the invention of Davies with respect to claim 15. Accordingly, Applicants need not further discuss Dreyer in relation to the patentability of claim 15, and claim 15 should be allowable over the background of Davies, the

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invention of Davies, and Dreyer. The rejections of claim 15 should therefore be withdrawn.

Claims 16-19 depend from independent claim 15, and thus inherit all the limitations of the independent claim. Secondary references Lin and Dreyer are merely recited for secondary features recited in claims 16-19 respectively. However, none of Lin and Dreyer is found to cure the deficiencies of the background of Davies and the invention of Davies discussed above with respect to claim 15.

Accordingly, Applicants need not further discuss Lin and Dreyer in relation to the patentability of claims 16-19, and claims 16-19 should be allowable over the background of Davies, the invention of Davies, and the secondary references cited against them respectively. The rejections of claims 16-19 should therefore be withdrawn.

V. **Allowable Subject Matter**

Applicants thank the Examiner for indicating that claims 3 and 4 are allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
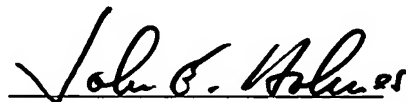
In view of the above stated remarks and arguments stated in connection with the rejection of claim 1, Applicants believe that claims 3 and 4 are in condition for allowance in their current dependent form by virtue of their dependency from claim 1. Accordingly, Applicants respectfully hold amending these claims into independent form in abeyance until the Examiner has had an opportunity to consider the above comments.

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VI. Conclusion

In view of the above, it is believed that this application is in condition for allowance and notice to this effect is respectfully requested. Should the Examiner have any questions, the Examiner is invited to contact the undersigned at the telephone number indicated below.

Should **any/additional** fees be required, the Director is hereby authorized to charge the fees to Deposit Account No. 18-2220.

Respectfully submitted,

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